

WHAT IS CLAIMED IS:

1. A heart valve prosthesis comprising a plurality of flexible leaflets, a commissure support and a plurality of fasteners inserted into the inner surface of the commissure support and protruding from the outer surface of the commissure support, the fasteners comprising an elongated portion and a tip at an end of the elongated portion.
2. The prosthesis of claim 1 further comprising a reinforcement on the commissure support.
3. The prosthesis of claim 2 wherein the reinforcement comprises an aperture.
4. The prosthesis of claim 3 the reinforcement comprises a plurality of apertures, wherein the tip of each fastener is inserted through one of the apertures and the commissure support.
5. The prosthesis of claim 2 wherein the reinforcement comprises biocompatible synthetic polymers.
6. The prosthesis of claim 1 wherein the tip is tapered.
7. The prosthesis of claim 6 wherein the end of the fastener opposite the tip has a head.

8. The prosthesis of claim 7 wherein the head is larger than the aperture in the reinforcement.

9. The prosthesis of claim 1 wherein the fastener comprises a barb.

10. The prosthesis of claim 1 wherein the prosthesis comprises tissue.

11. The prosthesis of claim 1 wherein the prosthesis comprises a stentless porcine valve.

12. The prosthesis of claim 1 wherein the prosthesis comprises three leaflets, each commissure support having a reinforcement.

13. The prosthesis of claim 1 wherein the fastener comprises a biocompatible material selected from the group consisting of metal, ceramic, synthetic polymers and combinations thereof.

14. A heart valve prosthesis comprising a plurality of flexible leaflets and a reinforcement secured to an inner surface of a valve commissure support, the reinforcement having an aperture.

15. The prosthesis of claim 14 wherein the reinforcement is secured to the commissure support by a biocompatible adhesive.

16. The prosthesis of claim 14 wherein the reinforcement is secured to the commissure support with suture.

17. The prosthesis of claim 14 wherein the reinforcement is secured to the commissure support by a fastener comprising an elongated portion, a tip at the end of the elongated portion and a barb.

18. A kit comprising a heart valve prosthesis, and fasteners, the prosthesis comprising a plurality of flexible leaflets and commissure supports, the fasteners comprising an elongated portion and a tip on the end of the elongated portion.

19. The kit of claim 18 further comprising a reinforcement having apertures.

20. A method for attaching a heart valve prosthesis in a patient, the method comprising inserting a fastener through the prosthesis into a aortic wall, the prosthesis comprising leaflets with valve commissures.

21. The method of claim 20 wherein the prosthesis further comprises a reinforcement attached to the inner surface of one of the commissure supports, the reinforcement having apertures for insertion of the fastener.
22. The method of claim 21 wherein the fastener is inserted into the reinforcement prior to inserting the fastener into the aortic wall or the pulmonary artery wall.
23. The method of claim 20 wherein the heart valve prosthesis is a stentless porcine valve.
24. The method of claim 20 wherein each of the commissure supports of the prosthesis comprises at least one reinforcement.
25. The method of claim 20 wherein the vascular wall is the aortic wall.
26. The method of claim 20 wherein a plurality of fasteners are inserted to secure the prosthesis to the aortic wall or the pulmonary artery wall.
27. The method of claim 20 wherein the fastener comprises an elongated portion, a tip at an end of the extended portion and a head on the end opposite the tip, the tip passing through the commissure support and

through the aortic wall or the pulmonary artery wall to secure the prosthesis to the aortic wall or the pulmonary artery wall.

28. A fastener applicator for implanting a heart valve prosthesis comprising:

- an inner shaft;
- an outer shaft with a sleeve and a plurality of pivots such that a section of the outer shaft can fold to extend the sleeve outward relative to the non-folding portion of the outer shaft;
- a suture needle within the sleeve;
- a base plate connecting the inner shaft and the outer shaft; and
- a handle providing for the relative motion of the inner shaft and the outer shaft through the folding of the outer shaft at the plurality of pivots.

29. The fastener applicator of claim 28 wherein the outer shaft has a plurality of segments and the handle has segments to provide for the relative motion of one segment relative to the inner shaft without moving the other segments of the outer shaft.